

What is claimed is:

1. A surface acoustic wave device comprising:
a plurality of surface acoustic wave elements connected
5 in parallel, wherein each of said surface acoustic wave
elements comprises:
at least three interdigital transducer
electrodes,
wherein said interdigital transducer electrodes
10 are operable to generate a surface acoustic wave that
travels in a propagating direction, and wherein each of
said interdigital transducer electrodes is formed of a
comb shaped electrode pair;
a first reflector electrode disposed at a first
15 side of said interdigital transducer electrodes; and
a second reflector electrode disposed at a second
side of said interdigital transducer electrodes,
wherein said first and second reflector electrodes
20 are disposed in the propagating direction of the surface
acoustic wave generated by said interdigital transducer
electrodes;
a ground connection electrode that connects together a
first part of each comb shaped electrode pair forming said
interdigital transducer electrodes; and
25 a ground pad that is connected to said ground connection
electrode.

2. The surface acoustic wave device according to

claim 1, further comprising at least one input pad and at least one output pad,

wherein a second part of each comb shaped electrode pair is connected with said at least one input pad or said at least 5 one output pad.

3. A surface acoustic wave device comprising:

a first surface acoustic wave element and a second surface acoustic wave element, wherein each of said first and 10 second surface acoustic wave elements comprises:

at least three interdigital transducer electrodes,

wherein each of said interdigital transducer electrodes is formed of a comb shaped electrode pair, and 15 wherein said interdigital transducer electrodes are operable to generate a surface acoustic wave that travels in a propagation direction;

a first reflector electrode disposed at a first side of said interdigital transducer electrodes; and

20 a second reflector electrode disposed at a second side of said interdigital transducer electrodes,

wherein said first and second reflector electrodes are disposed in the propagating direction of the surface acoustic wave generated by said interdigital transducer 25 electrodes;

at least one ground connection electrode, wherein, in at least one of said first and second surface acoustic wave elements, a first part of each comb shaped electrode pair

forming said interdigital transducer electrodes is connected together in common by said at least one ground connection electrode;

5 a ground pad that connects to said at least one first ground connection electrode;

a first element-to-element connection electrode, wherein a second part of a first comb shaped electrode pair in each of said first and said second surface acoustic wave elements is connected together by said first

10 element-to-element connection electrode; and

a second element-to-element connection electrode, wherein a second part of a second comb shaped electrode pair in each of said first and said second surface acoustic wave elements is connected together by said second

15 element-to-element connection electrode,

wherein said first and second element-to-element electrodes serially connect said first and said second surface acoustic wave elements in two stages.

20 4. The surface acoustic wave device of claim 3, further comprising a third surface acoustic wave element and a fourth surface acoustic wave element,

25 wherein each of said third and said fourth surface acoustic wave elements comprises a second plurality of interdigital transducer electrodes, wherein each of said second plurality of interdigital electrodes is formed of a comb shaped electrode pair,

wherein said first and said third surface acoustic wave

elements are disposed in said propagating direction of said surface acoustic wave, and are connected in parallel, and

wherein said second and said fourth surface acoustic wave elements are disposed in the propagating direction of the 5 surface acoustic wave, and are connected in parallel.

5. The surface acoustic wave device according to claim 4, further comprising at least one input pad and at least one output pad,

10 wherein a second part of at least one comb shaped electrode pair is connected with said at least one input pad or said at least one output pad.

6. The surface acoustic wave device of claim 5, 15 wherein, in at least one of said third and fourth surface acoustic wave elements, a first part of each comb shaped electrode pair forming said interdigital transducer electrodes is connected together in common by said ground connection electrode, and

20 further comprising:
a third element-to-element connection electrode, wherein a second part of a first comb shaped electrode pair in each of said third and said fourth surface acoustic wave elements is connected together by said third

25 element-to-element connection electrode;
a fourth element-to-element connection electrode, wherein a second part of a second comb shaped electrode pair in each of said third and said fourth surface acoustic wave

elements is connected together by said fourth element-to-element connection electrode; and

wherein said third and fourth element-to-element electrodes serially connect said third and said fourth surface 5 acoustic wave elements in two stages.

7. The surface acoustic wave device of claim 1, wherein said plurality of surface acoustic wave elements share in common one of said first reflector electrode and said second 10 reflector electrode.

8. The surface acoustic wave device of claim 6, wherein said first and said third surface acoustic wave elements share in common one of said first reflector electrode and said 15 second reflector electrodes.

9. The surface acoustic wave device of claim 1, wherein at least one of said first and second reflector electrodes is formed of a plurality of strip electrodes and a 20 bus bar electrode, and

wherein different gaps are provided between different adjacent pairs of said strip line electrodes.

10. The surface acoustic wave device of claim 3, 25 wherein at least one of said first and second reflector electrodes is formed of a plurality of strip line electrodes and a bus bar electrode, and

wherein different gaps are provided between different

adjacent pairs of said strip line electrodes.

11. The surface acoustic wave device of claim 4,
wherein at least one of said first and second reflector
5 electrodes is formed of a plurality of strip line electrodes
and a bus bar electrode, and

wherein different gaps are provided between different
adjacent pairs of said strip line electrodes.

10 12. The surface acoustic wave device of claim 9, wherein
said bus bar electrode comprises a first region and a
second region, and
said gap between respective strip line electrodes is
different in said first and said second region.

15 13. The surface acoustic wave device of claim 10, wherein
said bus bar electrode comprises a first region and a
second region, and
said gap between respective strip line electrodes is
20 different in said first and said second region.

14. The surface acoustic wave device of claim 11, wherein
said bus bar electrode comprises a first region and a
second region, and
25 said gap between respective strip line electrodes is
different in said first and said second region.

15. The surface acoustic wave device of claim 9, wherein

5 said gap between respective strip line electrodes is
different throughout an entire width of said bus bar electrode.

16. The surface acoustic wave device of claim 10, wherein
5 said gap between respective strip line electrodes is
different throughout an entire width of said bus bar electrode.

17. The surface acoustic wave device of claim 11, wherein
10 said gap between respective strip line electrodes is
different throughout an entire width of said bus bar electrode.

18. The surface acoustic wave device of claim 1, wherein
at least one of said first and second reflector
electrodes is formed of a plurality of strip line electrodes
15 and a bus bar electrode,
said bus bar electrode comprises a plurality of regions,
substantially identical gaps are formed between each
adjacent pair of strip line electrodes, and
lengths of the respective strip line electrodes are
20 different in said plurality of regions.

19. The surface acoustic wave device of claim 3, wherein
at least one of said first and second reflector
electrodes is formed of a plurality of strip line electrodes
25 and a bus bar electrode,
said bus bar electrode comprises a plurality of regions,
substantially identical gaps are formed between each
adjacent pair of strip line electrodes, and

lengths of the respective strip line electrodes are different in said plurality of regions.

20. The surface acoustic wave device of claim 4, wherein
5 at least one of said first and second reflector electrodes is formed of a plurality of strip line electrodes and a bus bar electrode,

said bus bar electrode comprises a plurality of regions, substantially identical gaps are formed between each 10 adjacent pair of strip line electrodes, and lengths of the respective strip line electrodes are different said plurality of regions.

21. The surface acoustic wave device one of claim 2, 15 wherein

said interdigital transducer electrodes are structured so that said at least one input pad and said at least one output pad operate in a balanced state.

20 22. The surface acoustic wave device of claim 5, wherein said interdigital transducer electrodes are structured so that said at least one input pad and said at least one output pad operate in a balanced state.

25 23. The surface acoustic wave device of claim 6, wherein

said interdigital transducer electrodes are structured so that said at least one input pad and said at least one output

pad operate in a balanced state.

24. The surface acoustic wave device of claim 1, wherein
in a case where there are n pieces, or more, of said
5 surface acoustic wave elements, wherein n = an integer of 2 or
more, said interdigital transducer electrodes are structured
so that each of said surface acoustic wave elements has an
impedance of $(50 \times n) \Omega$.

10 25. The surface acoustic wave device of claim 3, wherein
in a case where there are n pieces, or more, of said
surface acoustic wave elements, wherein n = an integer of 2 or
more, said interdigital transducer electrodes are structured
so that each of said surface acoustic wave elements has an
15 impedance of $(50 \times n) \Omega$.

26. The surface acoustic wave device of claim 2, wherein
at least two of said interdigital transducer electrodes
are connected together in common with said at least one input
20 pad or said at least one output pad.

27. The surface acoustic wave device of claim 5, wherein
at least two of said interdigital transducer electrodes
are connected together in common with said at least one input
25 pad or said at least one output pad.

28. The surface acoustic wave device of claim 6, wherein
at least two of said interdigital transducer electrodes

are connected together in common with said at least one input pad or said at least one output pad.

29. The surface acoustic wave device of claim 3, wherein
5 signals in said element-to-element connection electrodes are reverse-phased to each other.

30. The surface acoustic wave device of claim 3, further comprising an electrode for connecting said first
10 element-to-element connection electrode with said second element-to-element connection electrode.

31. The surface acoustic wave device of claim 2, wherein
said interdigital transducer electrodes are structured
15 so that impedance as viewed from said input pad or said output pad, is approximately 50Ω .

32. The surface acoustic wave device of claim 3, wherein
said ground connection electrode which connects together
20 in common said first part of the comb shaped electrode pair forming each of said interdigital transducer electrodes, and said ground pad, are disposed to be symmetrical to each other.

33. The surface acoustic wave device of claim 4, wherein
25 said ground connection electrode which connects together in common said one part of the comb shaped electrode pair forming each of said interdigital transducer electrodes, and said ground pad, are disposed to be symmetrical to each other.

34. The surface acoustic wave device of claim 1, wherein
said surface acoustic wave elements are formed on a
piezoelectric substrate.

5 35. The surface acoustic wave device of claim 3, wherein
said surface acoustic wave elements are formed on a
piezoelectric substrate.

10 36. The surface acoustic wave device of claim 6, wherein
one of said first and said second element-to-element
connection electrodes, and one of said third and said fourth
element-to-element connection electrodes, oppose each other,
and

15 signals in said element-to-element connection
electrodes that oppose each other have the same phase.

37. The surface acoustic wave device of claim 6, further
comprising:

20 a connection electrode which connects one of said first
and said second element-to-element connection electrodes with
one of said third and said fourth element-to-element connection
electrodes.

25 38. The surface acoustic wave device of claim 6, further
comprising:

a connection electrode which connects together in common
said first, second, third and fourth element-to-element
connection electrodes.